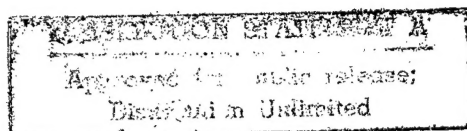




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# ***JPRS Report***



# **Science & Technology**

***Europe***

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# Science & Technology Europe

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## BIOTECHNOLOGY

### France: Protein Chemistry and Biology Institute Inaugurated

93BR0256 Paris *RECHERCHE TECHNOLOGIE*  
in French Oct-Nov 92 p 15

[Text] The first phase of buildings of the Protein Chemistry and Biology Institute [IBCP] was inaugurated by Hubert Curien in Lyon on 16 October. IBCP is a CNRS [National Center for Scientific Research] research unit contractually associated with the Claude Bernard-Lyon I University and affiliated with INSERM [National Health and Medical Research Institute]. IBCP's goal is to develop research in the areas of biosynthesis, protein structures and functions, procaryotes, and eucaryotes and to learn the nature of structure/function relationships at the molecular level.

IBCP is directed by Alain J. Cozzzone and is located in the southern part of the city of Lyon on the Gerland campus—which accommodates state and private research centers, training institutes, and industrial activities. Hubert Curien inaugurated it in the presence of Francois Kourilsky, CNRS's director general.

The IBCP's scientific committee recruited new personnel, selected internationally to ensure the quality of their work. Now there are 11 research teams with a total of 95 people, including 44 permanent researchers. Other researchers will eventually enlarge the staff, to reach about 150 people distributed over a total surface of 4,500 m<sup>2</sup>.

Whereas genetic engineering research has dominated the last 20 years, scientists' attention is now increasingly focused on the "final product" of gene expression: proteins. This research area interfaces with biology and chemistry and is particularly rich in perspectives. CNRS has, therefore, turned this sector into one of its strategic priorities.

Research currently conducted at IBCP, which is one of the centers of the national IMABIO [Biological Macromolecules Engineering] program, is organized around two major themes:

- Biosynthesis and post-translational modifications of proteins (photophorylation);
- Structure and function of extracellular proteins (collagens).

This research implies setting up different and complementary approaches that call, in a coordinated manner, on local teams and foreign teams, both French and foreign.

Locating IBCP in the Rhone-Alpes region was decided as part of the research decentralization policy undertaken by the Ministries of Research and Territorial Development in June 1990. In fact, personnel originating from the Ile-de-France area have priority for 30 positions.

#### [Box]

#### Research Topics

- Post-translational modifications of proteins in Gram-negative bacteria;
- Post-translational modifications of proteins in Gram-positive bacteria;
- Post-translational modifications of animal proteins;
- Chaperone and drug-resistant proteins;

- Extracellular matrix biology;
- Extracellular cell-matrix interaction;
- Connective tissue biochemistry;
- Cartilages and biomaterials;
- Collagen structures and engineering;
- Development and pathology of dental tissues;
- Molecular pathology of the dermo-epidermic juncture.

## COMPUTERS

### German Institutes Investigate Virtual Reality as Simulation Tool

93WS0100A Munich *TOP-BUSINESS* in German  
11 Nov 92 pp 163-168

[Article by Ulf J. Froitzheim under the rubric "Technology and Innovation": "Virtual Reality; Creators of Make-Believe Worlds"; first paragraph is an introduction]

[Text] Fraunhofer researchers are taking computer-controlled voyages of discovery in imaginary realms in the quest for better design tools. Their refined simulation software is now on the threshold of commercialization.

Filing cabinets float freely in the room, the ceiling suddenly takes off on its own and flies away, a man walks directly through the wall into the office that is open at the top. The only thing still missing is for a clock to drip over the edge of the table down to the floor, as in Salvador Dali, for the surrealist interactive 3-D movie to be perfect.

But even without such a gag the spectacular work of art, that will never be seen in standard movie theaters, is attracting interested parties to Stuttgart-Vaihingen from all directions. There are only individual showings there—exclusiveness with a solid technical background: Because the viewer can join in the action at any time, the coordination of just a few participants would be almost an unsolvable problem for the computer that gives man admission to this unreal world. Besides, the special eyeglasses needed for this are quite simply in short supply and expensive.

It is no cineasts that are trying to get a hearing for this three-dimensional mini-movie theater, but businessmen, computer scientists and engineers. The place where it is happening, you see, is the software laboratory of the Fraunhofer Institute for Labor Management and Organization (IAO). Together with its twin, the nearby Fraunhofer Institute for Production Engineering and Automation (IPA), IAO is presently regarded beyond Germany's borders as the first address for applications of a new kind of simulation technology. "Virtual reality" (VR)—a world of illusion produced by the computer which one comes into by means of special eyeglasses and sensor-equipped data gloves—is quite soon to help industry to lower design costs and markedly shorten development time.

In the meantime office equipment and furnishings firms are especially getting turned on by the new trend. Wolfgang Kosanke of Wini Bueromoebel Georg Schmidt GmbH & Co. KG [Wini Office Furniture Georg Schmidt Limited Liability Company & Co. Limited Commercial Partnership] of Coppenbruegge in Westphalia finds virtual reality to be "tailor-made for the planning of office spaces." And for Peter Dehoff, head of the lighting engineering department at



Zumtobel Licht [Lighting] GmbH in Dornbirn, VR is the logical development of pseudo-three-dimensional computer graphics, with which the industry had to be content till now if designs had to be illustrated.

"This technology makes a space able to be experienced as a great deal more three-dimensional," the Vorarlberg manager says enthusiastically, "because one stands more or less right in the middle of it." Yet, Dehoff is certainly no dreamer but an experienced expert on the subject: Electronic design tools have been used already for years under his management at Zumtobel, one of the large European lighting manufacturers.

The Austrian company is one of the first members of an exclusive circle of industrial partners that want to develop jointly with IAO application-ready VR software. A maximum of 12 participants can join this circle—which officially calls itself the "Virtual Reality Competence Center"—for a yearly contribution of 50,000 German marks [DM]. The goal of the three-year project is to put into the hands of industrial designers and interior designers a tool with which they not only construct in a flash a life-size (even though intangible) model of their designs, but can even touch, move and redesign it at will.

"We are looking for methods that, though they retain the ordinary working tools, nevertheless no longer require a physical product," Wilhelm Bauer, the IAO department head in charge of the competence center, holds forth.

#### Familiar Symbols Used

From the building, to the equipment and furnishings, to the lighting, everything that has to do with exterior and interior design is to be represented in the future by means of applied computer science. All the same, the developers are using familiar symbols—on the model of the "file" and "wastebasket" pictograms in modern office communication systems. For instance, there will even be digital emery paper, digital saws and digital paintbrushes in one day's electronic world of illusion.

Some of the participants in the project have already been settled on, though the registration period still runs to December 1. Besides the Zumtobel company, which wants to further develop its software for lighting simulation, the Koenig & Neurath, Wini and Waiko office furniture manufacturers have agreed, and in addition the data processing subsidiary of the Stuttgart construction giant Ed. Zueblin AG [German Stock Corporation], RIB/RZB. In addition, a carpet manufacturer is to be included in the team, whose software-implemented collection of samples allows the imaginary offices to look so truly realistic. It is conceivable in the long term with all these components that the architect will invite the building owner to a digital tour of his completely furnished house already before the first spade is dug.

But not only is the construction industry one of the party at the competence center. A commercial-vehicle manufacturer that would like to optimize the ergonomics of driver's cabs by means of virtual reality has also reported its interest according to IAO's statements. For the new kind of simulation makes it possible to put such working spaces step by step into the most clear and suitable form without even constructing a single model.

#### Giving Gas With the Thumb

Fraunhofer man Bauer sees in this "virtual prototyping," a variation of "rapid prototyping," an especially exciting application field: "We think that with VR we can markedly shorten the development cycle."

The German researchers have in the meantime left far behind even the original inventor in perfecting the cyberspace, as virtual worlds are called in the technical jargon. The idea comes from the U.S.—as does also all the apparatus installed in Stuttgart. However, first of all the entertainment industry has taken over the technology there. Industrial applications are not yet a major topic. For instance, the first cyberspace amusement arcade opened in the summer in Chicago, where the for the most part young guests now engage in interstellar combat in three-dimensional space. Complete different equipment is in operation there than at IAO, however; that is, "Virtuality" machines from W-Industrie, Ltd. of Leicester, England.

Of course, the pioneers of industrial VR applications do not want to be named in the same breath with this seller, in whose three-dimensional world-war games one can put oneself in the role of the "Red Baron," Manfred Freiherr von Richthofen, for example. "Bread and games is the name of the trend," deplores Matthias Ehrlich, marketing head of hardware manufacturer Silicon Graphics GmbH in Grubbrunn near Munich. "But these shoot-me-dead games unfortunately do not exactly foster confidence in the seriousness of our work." On the other hand, Fraunhofer supplier Silicon Graphics is cooperating with the small but renowned VR specialist VPL Research of Redwood City, California. Whose "eyephone," like oversized diving goggles, forms, as the supporting visual display unit, together with the "dataglove" the basic equipment of every serious cybernaut (literally, cybernetic mariners), as the scouts in their imaginary world are called in VR slang.

#### Equipment of the Finest Sort

Two miniaturized color monitors employing LCD technology, that are put into the eyephone along with wide-angle optics and an earphone, form the window to the virtual space. Along the lines of classical stereoscopic photography, they both simulate laterally displaced images that the graphics computer balances in synchronism—perspective vision. A point of the finger is sufficient in each case in order to move oneself forward or back, to move walls, or make objects float and set them down again. For the computer that projects the images before the viewer's eyes is controlled by the dataglove.

The principle according to which the dataglove functions is simple: Optical fiber cables on all the fingers as well as a position sensor (Polhemus sensor) on the back of the hand report to the computer any ever so slight movement. The stronger a finger is bent, the less light the optical fiber in charge lets through. The computer identifies by these brightness differences the respective gestures: The outstretched index finger gives the direction of the motion and the thumb serves as the gas pedal, as it were: If it points upward (full light), it means "Stop," and if it presses against the index finger (light beam interrupted), the person moves deeper into the scene. A second position sensor installed at the back

German theoretical physicist, Klaus Fuchs, was a communist. At the beginning of the 1930's he left Germany, as the rise of fascism made it dangerous for him to remain there. In 1934 he settled in England and several years later became a British citizen. In 1941 Fuchs was invited by another German emigre, physicist R. Pierls, to join his group. This group was working on problems related to the development of nuclear weapons.

Fuchs soon learned that the work was being kept secret from the USSR—a war ally. He considered this unconscionable and reported all his information to representatives of the People's Commissariat for Defense in the Soviet Embassy in London. Later on, Soviet intelligence residents established contacts with Fuchs and a systematic transfer of information to Moscow.

In the USSR the government established a scientific-technical center for the development of nuclear weapons in 1943. On the recommendation of Academician A. Ioffe, I. Kurchatov was appointed the center's director. He truly was the best candidate—an excellent physicist with exceptional organizational talent. Igor Vasilyevich was an incredibly charming man, which is very useful when one has to deal with great numbers of absolutely different people.

In carrying out the government's decision, Kurchatov started to put together an institute on the outskirts of Moscow that was named Laboratory No. 2 of the Academy of Science, although, naturally, this organization had nothing in common with the Academy. Kurchatov was familiar with the work by Zeldovich and myself and offered me responsibility for the development of a nuclear charge or, as it is often called, the atomic bomb. I agreed.

In 1946 the government made a decision to organize a special institute for this type of work, currently called VNIIEF—the All-Russian Scientific Research Institute for Experimental Physics (Russian Federal Nuclear Center).

In 1946 the first nuclear reactor (scientific—not industrial—of course) in the USSR was put on line in Kurchatov's Laboratory No. 2. Then plutonium separation and production plants were built. Our scientists contributed many completely new ideas to the development of extremely precise electronic and optical instruments for hydrodynamics measurement, measuring equipment for nuclear physics research, and registration of various types of radiation produced in the process of a nuclear explosion. In effect during those years a new branch of science and technology—the nuclear branch—was created within an extremely condensed time frame. Building the first nuclear bomb took tremendous effort on the part of many scientists, engineers, technicians, and workers.

From 1943 to 1946 Fuchs worked together with R. Pierls' group in the United States; then he returned to England. The information passed over by Fuchs and other agents encompassed a wide range of science and technology disciplines needed to build nuclear weapons. For instance, the nuclear reactor where plutonium is formed under the impact of a powerful neutron stream; various calculations; and finally a detailed design of the first American nuclear

charge. Of course, we could not accept this information unquestioningly. It could contain elements of disinformation—after all, we had no notion how this information was obtained—and therefore needed to be carefully verified, with additional calculations made.

We did indeed know of the feasibility of plutonium extraction from articles by E. MacMillan, F. Abelson, and L. Turner published by them in the still-open press in the June and July 1940 issues of the *PHYSICS REVIEW*.

We conducted large-scale experimental research on measuring parameters in a construction under the pressure exerted by the products of the explosion of a substance with a 1-2 tonne mass, as well as various nuclear physics research.

When we received information that the bomb we had been informed about had been successfully tested in the United States, it became clear that it was best for us also to test this particular design. We needed the fastest and most reliable method to show that we also had nuclear weapons. The more effective designs we envisioned could wait. They were developed in later years.

As is known, the first atomic bomb test in the USSR was successfully conducted on 29 August 1949.

The entire Soviet people should be deeply grateful to Klaus Fuchs for the extensive information he passed to Soviet physicists. In the USSR this contribution—like everything else associated with the NKVD [People's Commissariat for Internal Affairs]—was kept secret. After Fuchs' release in 1959 I asked D. Ustinov to enter a petition to grant Fuchs an award for the assistance he had rendered the USSR. Dmitry Fedorovich held high positions in the state and party apparatus and attentively followed the work on the development of nuclear weapons. He agreed that this should be done and said that he would try. He did not get a positive result, though.

With respect to the first hydrogen bomb, this is what happened.

In the United States the idea of developing a hydrogen bomb (or superbomb, thousands of times more powerful than the atomic one) was advanced by a Hungarian emigre, the very talented theoretical physicist Edward Teller, in 1942. He and his group of assistants were actively working on this particular project, and by 1946 he believed that basically the possibility of creating a hydrogen bomb was a proven matter. Information regarding this development was passed by Fuchs to our intelligence.

While the expediency of developing hydrogen charges was being discussed, mathematician Ulam (also an emigre) and his assistant Everett carefully checked Teller's calculations in 1950 and discovered that the proposed concept was faulty. American specialists realized that Teller's hydrogen bomb design was unworkable and the direction chosen for its development would lead to a dead end. Accordingly, all

spearhead "research and design" work in various fields with potential space impact, such as:

- The design and development (especially through plasma projection techniques) of materials such as beryllium, which combines low density and high mechanical stress, or ceramics, usable for thermal shields;
- The hardening of on-board electronic components based on in-depth know-how of their conditions of vulnerability in space. [passage omitted]

In the following, we review briefly the test capabilities of the Aquitaine Center for Scientific and Technical Research (CESTA) which lend themselves to space applications.

#### CESTA Test Capabilities

##### Satellite Launch Simulation

Within the framework of implementation policies, CESTA has been involved in the space field since 1975. Meteosat, SPOT [Provisional Earth Observation Satellite], Giotto, Eurostar, Hyparcus, ERS1 [European Remote Sensing Satellite], etc., are all representative of some 30 satellites, subassemblies, or energy tanks which have been tested by CESTA for over 15 years. The majority have undergone centrifugal testing. The centrifuge, by its technical performance and its cargo capacity, constitutes a testing device that is well suited to the simulation of static and combined G-loads which a satellite undergoes during its propulsive phase. It makes it possible to generate a field of uniform constraints capable of indicating any structural deficiencies.

With a view to improving the accommodation of ever more bulky satellites and optimizing working and security conditions, CESTA has procured a new class 100,000 integration room, that was inaugurated by President Chaban-Delmas on 5 December 1991. The room, 420 square meters and 10 meters high under hooks, meets space requirements for temperature, cleanliness, and hygrometry. The first satellite to be tested in this unit is the Cluster satellite (ESA), to be followed by SAX (Alenia), the Huygens probe, and others.

##### Aerothermodynamics, Materials, and Structures

The capabilities in this area are those which DAM has acquired in the design of nuclear-warhead reentry vehicles. This design presumes the mastery of all aspects of hypersonic aerodynamics (rarefied flows, turbulent flows, etc.), as well as aerothermodynamics, which makes it possible to determine heat transfers on the surface of an object and the physico-chemical changes affecting the flow. The relevant digital simulations are developed by CESTA's thermal laboratory.

This laboratory is capable of simulating the heating effect undergone by objects in ballistic flight at the beginning of the reentry phase into the atmosphere. To do this, it has a test bench which can generate thermal flows of 4 MW per square meter of tested surface in a matter of seconds.

Materials evaluation and characterization systems for either metallic, composite, or ceramic structures have also been developed in the infrared field.

##### Electromagnetic and Radiation Effects

CESTA is especially equipped for the study of electromagnetic and radiation effects on on-board structures and

electronics. It has transient ionizing radiation sources delivering up to 0.5 cal/cm<sup>2</sup> in the keV-level X-ray energy range and electromagnetic impulse generators based on the interaction of photons with the system. It is specializing in the study of the X-ray radiation strength of very thin films.

In the field of electromagnetic studies, it can provide antenna diagrams and study equipment integration.

##### Meteorite Impact Simulation

Because of its expertise in detonation systems, CESTA is able to perform experimental simulations of the impact of meteorites on various targets. This simulation is carried out in the form of uniform fragments launched by explosives or by weapons at speeds of 15 km/s and by metallic blasts reaching even higher speeds.

## ENERGY, ENVIRONMENT

### Netherlands Launches 'Durable Technologies Development Program'

93BR0238 Zoetermeer WETENSCHAPSBELEID in Dutch  
Nov 92 pp 14-16

[Article by Alette Warringa: "Durable Technologies as Both Opportunity and Challenge—The Rock of Sisyphus"]

[Text] "We are not suggesting that durable technology will be a panacea. Rather it is a vital link in the use of energy."

Even if the population and affluence growth curves increase only half as fast as expected, humanity will still exceed the available environmental resources by a factor of 10 to 50 in the coming decades. The Dutch multidepartmental research program Durable Technological Development (DTO), which was set up this year, is trying to find technological solutions for this problem. Until now Sisyphus, or western technology, has been progressing without its rock. From now on, the rock must also be carried.

"Technology is a dominant factor, not just in the industrialized countries, but also in the world as a whole," said Prof. Dr. Ph. J. Vergragt of the Ministry of Housing, Regional Development, and Environment, and one of the program initiators. "Countries that are in the process of development nearly always adopt western technology, complete with all its shortcomings. Durable technology that does not exhaust resources, requires little energy, and does not generate much waste, would provide a shortcut to a better existence. We do not intend to suggest that durable technology will be a panacea. Rather, it is a vital link in improving the energy efficiency on earth."

Durable technological development is directed toward the long or very long term. The shorter term prospects for the Netherlands have already been highlighted in reports such as "Caring for Tomorrow," issued by the State Institute for Health Care and Pollution Control (RIVM), the National Plan for the Environment (NMP and NMP+), and the PRISMA [Parallel Inference and Storage Machine] project from the Netherlands Organization of Technology Assessment (NOTA).

It is not DTO's intention to start immediate development of these future technologies; it will be more the putting into effect of a thinking process. Vergragt: "The program will have succeeded if we succeed in impregnating technological



innovators with a sense of durability in the next few years, as has already been achieved for factors such as speed, safety, or cost-performance ratios. If the program produces concrete products within the short term, I feel we should see them as a sort of spin-off."

#### New Directions

Five Dutch ministries<sup>1</sup> have given their support to the program, which is led by Prof. Dr. Eng. J.L.A. Jansen. A report, entitled "Durable Technology: A Technological Challenge<sup>2</sup>," contains the outline of the program, which will last for five years. It will cost a total of 25 million Dutch guilders, the greater part of which will be paid by the government. There are three phases, which are closely interrelated; a beginning phase, a try-out phase, and an demonstration phase. Then implementation phases will follow, for which the larger part of the financing will come from business.

As a matter of fact, the authors call the program not a policy plan, but an exploratory research program. DTO must lead to new technology choices in the distant future. To achieve this, deliberate abstractions were made from the reality of here and now.

Vergragt: "The cultural structure within which technology functions places—unknowingly—limits on innovation. We are quick to say that something is not possible, just because it does not fit within our culture. We want to break through this impasse."

The complete range of possibilities must be considered. Only then can a rational choice be possible. Mostly it will involve new combinations of existing technologies or technological concepts, but completely new ideas are also conceivable.

Vergragt said: "Anyone who wants to develop an environmentally friendly car, for instance, can begin to work on various levels. He can put in a catalyzer that picks up the exhaust gases, which is what happens now. Then he will only be improving upon an existing installation. He can also develop an engine which requires far less fossil fuel; in other words, he can develop a new installation. One step beyond is a new technology, such as a car that uses hydrogen for fuel. Still further, there would be a completely new product; no longer a car, but, for instance, a capsule that glides through the air. The highest rung of the ladder could be the infrastructure: not a physical means of transport, but an advanced form of telecommunications."

Every step requires its own preparation time; the higher the level of adaptation, the more time becomes necessary for development of a technology and—above all—for its introduction.

The durable technology development program must produce the following: criteria for durability; a clear description of the technological challenge which can provide guidance for researchers; recommendations with regard to the continuation of research and the development of durable technologies; and better communications between all involved, including the public at large.

"Communicative designs" must also be produced to visualize technical products or systems that provide durable solutions for social needs. These designs are derived from

illustrative processes, i.e., experimental projects that should visualize technological concepts for businesses and the public at large. They can be experiments, or a kind of master project that leads to demonstration projects. Initially, some 10 to 15 illustrative processes will be started before 1997.

Vergragt: "An illustrative process must show what durable technology can look like. Without a practical demonstration it will all remain a theory, and no one would know if it were feasible."

#### Backcasting

Environmental user space is the total capacity of the earth to support our present life and that of future generations. In order to find a standard for the amount of environmental user space that the new technologies can take up, the DTO team has applied a kind of reversed Exploration Strategy. With a wink at the ongoing explorations, which include concepts such as "foresight" and "forecasting," the authors of DTO have called this procedure "backcasting."

For this, a rough estimate was made of the population size by the year 2040 and it was calculated that the standard of living in the Third World would have risen by 4 to 6 percent compared to 1990, and by 1 to 2 percent in the West. To meet all obvious needs, such as food, clothing, transportation, accommodation, production, and water consumption at these standards of living, the environmental user space will have been overrun by a factor of 10 to 50 long before 2040.

An illustration: If individual motorized transport were to continue to grow at its present rate, cars would need to be developed with a fuel consumption of 1 to 200. Or: If every citizen of the world were to want a comfortable house, these would have to be built with 10 to 20 times less raw materials for building materials and 10 to 20 times less fuel.

The aim of "backcasting" is to indicate how much saving, economizing, and rationalization is necessary. The impact of a discovery or an intervention is easier to judge on the basis of the (sharply) falling figures, which, according to this ideal model, must be reached. Are they in fact attainable?

Vergragt again: "Probably, but the magnitude of the challenge is enormous. Those technologies with which we are now familiar give a savings of perhaps a factor of three to four. With the illustrative processes we hope to be able to show in what direction future cultural swings could go."

The illustrative processes will be divided among a number of requirement fields: clothing, food, transportation, accommodation, production, water requirements, lighting, purification, grinding, and crushing. Selection criteria include technological challenge, prospects of resulting in a durable breakthrough, economic factors, possible spin-offs, and the expectation of acceptance by society.

#### Continuous Dialogue

Contacts with the OECD [Organization for Economic Cooperation and Development], with France, Japan, and various other countries have been providing positive results so far.

Vergragt: "Japan is developing a rigidly scheduled program for durable technologies. Several hundred researchers are involved; the scope in time is 100 years. The DTO research

"A natural question is how Fuchs' information influenced Stalin's decision to give life to the Soviet atomic project. I think this information could be of great political importance for Stalin. The technical side of the matter was subordinate to its political significance. When writing about Fuchs, this side of the matter is often overlooked.

"Another issue is of a more technical nature: whether it is possible to correlate in time the information passed by Fuchs with the progress of the Soviet atomic project. An interesting fact merits attention in this respect. During the war almost all the questions the Soviet side posed to Fuchs were illiterate from the point of view of physics. I am curious as to who was the author. I simply cannot believe that they were asked by Kurchatov, Khariton, or Zeldovich. And we also know that after 1945 Fuchs was being asked very specific, very precise questions."

[Smirnov] Still, how much, in your opinion, did the Soviet project benefit from the intelligence?

[Halloway] When I attempted to evaluate how much the Soviet Union gained from Fuchs' information, I looked at the experience of postwar Britain. There were about 20 Englishmen working at the Los Alamos Laboratory. When after the war the cooperation between the United States and Britain in the area of nuclear weapons came to an end, all of them, including Fuchs, returned home in 1946—that is, one year after the atomic weapons had been tested in the United States—and got busy with the development of the British atomic bomb. Still, the British, with their quite high level of industry and technology, had great difficulties. Despite the fact that they were very well informed, there was a multitude of problems they had to solve on their own. Of course, the USSR had less information from outside than Britain did. So you had to go a longer and more difficult road. (The first British atomic bomb was detonated three years after the Soviet one.—Yu.S.).

Fuchs' important role in the history of the Soviet atomic project does not diminish the Soviet physicists' contribution. Besides, the most labor-intensive problem in the development of an atomic bomb is not its theoretical development but the practical organization, the creation of appropriate industries and new technologies.

[Smirnov] What can you say of the statements of our "nuclear" intelligence officers that have lately been appearing regularly in the mass media?

[Halloway] I do not see in these publications anything that is incorrect from the point of view of factual material. They do contain, however, a clear political design: It was not so much the physicists as the KGB that ensured the creation of the Soviet atomic bomb. And, speaking of the hydrogen bomb, not Sakharov...[end Halloway]

History chose the United States and the Soviet Union to become the pioneers of the nuclear age that became a turning point in the development of civilization. More than anyone else, these two powers have experienced to the full extent how the nuclear race accelerated and even subordinated to itself the most advanced science and

technology. These countries were the first to realize that possession of nuclear arms does not provide a decisive advantage for either side—on the contrary, it presents the threat of mass destruction. Having created global problems, including those of a moral nature, nuclear arms now determine the strategy of world politics. For this reason researchers will keep coming back, over and over again, to the dramatic beginnings of the atomic saga, in an attempt to "dig up" their true contents.

## STRATEGIC ARMS REDUCTIONS

### Larionov Ponders Russian Nuclear Strategy in New Conditions

934P0047A Moscow NEZAVISIMAYA GAZETA  
in Russian 19 Dec 92 p 2

[Article by Professor Valentin Larionov under the heading "Security": "Strategic Dilemmas of the Nuclear Age: Catastrophe Can Only Be Prevented"]

[Text] In the debate over what concept should form the basis of Russia's nuclear strategy, i.e. first strike [pervyy udar], retaliatory counterstrike [otvetnyy-vstrechnyy udar] or retaliatory strike [otvetnyy udar], thus far preference in strategic planning has been given to the retaliatory counterstrike option.

However, V. Repin, a leading technical expert, proposes that the first strike option be made the basis of our planning; this would allegedly provide tremendous advantages in terms of Russia's security and would deter nuclear war (see NEZAVISIMAYA GAZETA, 24 September 1992). Earlier, political scientist A. Arbatov published his arguments in favor of the concept of a "retaliatory strike" (NEZAVISIMAYA GAZETA, 10 March 1992).

I do not wish to assume the role of arbiter, but I do not fully share the view of either individual. I base that statement on my personal and collective experience with the development of the theoretical foundation of Soviet nuclear strategy, and on its evolution and the circumstances which dictate it.

In the late 1950's and early 1960's I was one of the authors and compilers of the book "Voyennaya strategiya" [Military Strategy], which was edited by Marshal V. Sokolovskiy. Some historians of Soviet military thinking ironically call the period when the idea of this much talked-about book was maturing and when the actual work on it was being done the "romantic" period in Soviet nuclear strategy. Indeed, in those years it seemed to us that we were finally witnessing the arrival of that long-awaited moment when the cherished dream of all preceding generations of strategists would become a reality, i.e. that with the aid of the means of force under our command we would have the ability to achieve any military or political objectives, even the most extreme ones. Strategic planning organs did not even give any thought to what form a mass

Soviet missile strike would take, whether it would be a first strike or a retaliatory strike. The United States' missile gap solved every problem for us.

By the late 1960's Soviet-American nuclear parity had been established. As a result the focus shifted to the technical and combat readiness of the nuclear missile component of our armed forces. Calculations of the two sides' capabilities with regard to early warning, the length of time required to prepare for a strike, weapons systems guidance and strike results became a part of the picture.

Then world theory began acknowledging the superiority of a disarming first strike. A short while later intensive research began on the concepts of a second retaliatory counterstrike or a retaliatory strike.

I should note that emerging parity was not the only impetus behind this boom; there was also the appearance of new types of missile technology (MIRVed missiles, mobile ground launchers, and the new SLBM's). A major role in the selection of our hypothetical model for employment of nuclear missiles was played by ideological and psychological considerations. The USSR's political leaders, attempting to appear peace-loving to world public opinion, demonstratively rejected the first strike concept. But a purely retaliatory strike did not suit them, either. That was mainly due to psychological considerations. In the people's mind a retaliatory strike could not perform its role of guaranteed retribution if the United States were able to mount a successful counterforce strike.

Thus appeared the "saving" formula of the "retaliatory counterstrike" and complex technical and mathematical calculations were undertaken. These were also necessary to justify for domestic consumption the USSR's position at the Soviet-American strategic arms limitation talks (SALT-1), which began in 1969.

Typically, all calculations at that time were based on the assumption that nuclear weapons would be used. Essentially it was only in the late 1980's that there was a radical change in the two sides' strategic thinking, planning and behavior. They finally acknowledged something that had long since become clear to everyone else: there would be no winners in a nuclear war, and such a war must be prevented at all costs. This was set forth in an official statement resulting from the meeting between Mikhail Gorbachev and Ronald Reagan in Geneva. Since that meeting many encouraging steps have been taking in that direction in Soviet-American strategic relations, this year in particular.

For instance, today all concepts regarding the use of strategic nuclear weapons must be assessed from the standpoint of how well they fit in with the idea of preventing nuclear disaster, not of who will prevail in the "race to annihilation."

In that regard the first strike concept proposed by V. Repin would place us, on a psychological level, in the same frame of reference as American nuclear planners, and would apparently strengthen the nuclear deterrence

system. But one must not forget that the negative aspects more than compensate for this psychological effect. Firstly, in order for the first strike strategy not to be merely a bluff over the long run, each year ever-increasing allocations would have to be made to fund research and development efforts. Military science would constantly be seeking new models of weapons capable of guaranteeing the success of a first strike.

Secondly, reliance on a first strike would require a permanent state of heightened combat readiness at missile bases, and in view of the increasing technical complexity of the system it is becoming more and more difficult to provide that without using computers to control those systems. Thus people would be forced to turn over their monitoring and control functions to machines and would become their prisoners. But, as you are aware, a breakdown in some part of this system is difficult to prevent, and even more difficult to correct in the midst of rapidly unfolding events.

Thirdly, preparedness for a first strike would, as A. Arbatov correctly notes, undermine the atmosphere of trust that now exists in Russian-American strategic relations and in joint efforts to prevent war.

Finally, a first strike is one attribute of the offensive doctrine that Russia has already abandoned, both as a legacy of Soviet defensive doctrine and as the source of the concept of nuclear missile "non-targeting."

The concept of a retaliatory strike also has pluses and minuses from the standpoint of preventing nuclear war. Its advantage lies in the psychological effect that will ensue in the event that we state this policy. It would be another step in a chain of confidence-building measures on our part which has spurred on the United States: first there was removal of targeting instructions from a portion of our missiles, then the complete removal of missiles from combat alert status, and now rejection of a retaliatory counterstrike.

But a retaliatory strike is dangerous due to its chilling effect. A number of research and design projects could be terminated, but that is not always beneficial. Furthermore, according to mathematical calculations implementation of the idea of a retaliatory strike requires quantitative warhead superiority, so that enough will remain intact to launch a retaliatory strike against the enemy. And that undermines the fundamental principles of the balance of forces agreements that have been reached.

If someone asked me which of the two concepts now under discussion should be selected, I would reply: a concept of measures designed to prevent a nuclear attack of any type.

Such measures, in addition to those already being implemented or currently being negotiated with the United States, could also include:

—a mutual agreement to remove missiles targeted at the territory of both the United States and Russia from combat alert status;



all network users. Consensus has not yet been reached on this point by manufacturers. [end box]

#### Developing a Single International Field Bus

Until now, Profibus and FIP have been unable to agree on a common data structuring method. This has not stopped about 40 manufacturers throughout the world from coming together under the IFC [International Field Bus Consortium] banner to work on implementing CEI specifications. In the IFC framework, Rosemount, Honeywell, and Ronan Engineering have developed a specific circuit operating at 31.25 Kbit/s which will be used in a real work environment when software tools are ready in 1993. The consortium has plans for a demonstration on equipment interchangeability in a heterogeneous architecture, but a date has not yet been specified.

Last spring, Rosemount broke ranks with the IFC. ISP's [Interoperable Systems Project] creation was announced in September. ISP is the brainchild of Rosemount, backed by other heavyweights in the command-control and automation sector: Fischer Controls International, Siemens, and Yokogawa Electric. ISP's project is to "develop a unique international field bus" with a view to making all equipment interoperable by 1994. This initiative came about as the result of a CEI announcement that the international standard proposal for the application layer would not be ready before 1994, and that an additional "one year's work to verify specifications" was required. Some CEI participants are reacting. Patrice Noury, marketing manager for industrial control at Cegelec, said: "The last working document on the application layer that was sent to national committees for their comments contained technical errors and was criticized. Rather than waiting for the normal procedure to run its course, we suggested an immediate counterproposal to speed the process. Under these conditions, there will be six to nine more months of work. Many more if we do not reorganize our way of working." The race against time is now under way between the delayed CEI standard and a standard that the ISP initiators are in a hurry to see delivered.

[box, p 16]

#### FIP's First Validations in the Field

Under the framework of the ESPRIT [European Strategic Program for R&D in Information Technologies] DIAS [Distributed Intelligent Actuators and Sensors] project, a FIP-based automation system has been installed in the Italian Piombino power station. The aim was to develop the first intelligent actuators and sensors using this communications protocol and to validate in the field the integration concepts of various functions linked to the operation of an automated installation.

The installation was carried out on one of the eight high-pressure preheaters in one unit of the 320-MW power station. The data was routed on two redundant mediums, each comprising a 200-meter section supplying the control room and a 500-meter section in the plant itself. The network linked a total of 56 instruments equipped with microprocessors to perform local operations and which exchanged data on the network with the help of FIP integrated circuits. Bailey Elsacontrol supplied the pressure

sensors; Biffi, the analog on-off gates; and Schoppe & Faeser (Hartmann & Braun), the temperature sensors and analog valves.

Other than the process's command-control function, the distributed architecture includes two functions linked to intelligent sensors. One is for the control and configuration of instruments; the other is for maintenance. The sensors and actuators have in fact many functions, which are remotely controlled by a supervision and configuration system: alarm thresholds, correction of parameters in relation to the ambient temperature, memorizing operations, adjusting deviations due to aging sensor cells, memorizing service dates, etc. Interoperability problems arise in installations where hard- and software of different origins must exchange data. Because of a lack of standardization in the area, specific exchange regulations have been devised for this particular project. To simplify matters, data refreshing is carried out in a cyclical mode in Piombino. Critical data, variables concerning levels, controls, as well as valve index values are updated every 50 milliseconds; maintenance data are updated every two seconds. Data flows reach about 500 Kbit/s, or half the FIP capacity. The automated system became operational last April for a period that should last at least until the end of July 1993.

### LASERS, SENSORS, OPTICS

#### Thomson Unveils 'Highest Power' Laser Diode

93BR0233 Paris *ELECTRONIQUE INTERNATIONALE*  
HEBDO in French 26 Nov 92 p 28

[Article by Florence Ladouce: "Power Laser Diode: Thomson Takes Center Stage with Planar Structure"]

[Text] Thomson Hybrides has just broken a world record for optical power output from a planar-structure power laser diode. This type of structure may reduce the price per "optical watt" and make possible high-power, high-rate, or even continuous output.

With their ability to provide more than 1 kilowatt of power in Quasi Continuous Wave (QCW) mode (the term QCW applies to long-pulse-duration lasing, for example, with 200-microsecond pulse duration at 100-Hz repetition frequency), power laser diodes are an excellent substitute for flash bulbs in solid-state laser pumping; they also constitute a marked improvement in terms of reliability, efficiency, and size. Moreover, their potential applications are numerous. They can be used in fields as diverse as telemetry, surgery, blasting, and open-space transmissions. However, their market is still in its infancy and will not mature before their price reaches "acceptable" levels. This is the challenge undertaken by power laser diodes manufacturers: To bring down the price of a Watt from its current level of about 100 French francs [Fr] to Fr10 before the end of the decade. Thomson Hybrides is one such firm. Although it only began developing power laser diodes in 1987—American firms had long been active in the field—the French company, which enjoys backing from the DRET [Research, Studies and Technologies Directorate of the Ministry of Defense], STEI, and MRE [Ministry of Research and Education], appears today quite competitive. It recently came up with a world first in the form of a prototype planar-structure laser diode with a power density of 1

kW/cm<sup>2</sup> in QCW mode. This structure is based on technologies similar to those used with semiconductors, and therefore shows great promise with respect to cost reduction.

In order to achieve high optical power outputs, laser diodes currently on the market make use of two-dimensional structures which are often called "stacks," as they consist of several stacked array-structured diode strips. A diode array is a laser diode with more than one current-feed ribbon (a laser diode's power may also be increased by using a single, wider ribbon; however, several narrower ribbons give better results). For example, at Thomson, such a 10-ribbon diode with a 100 x 1 micron<sup>2</sup> emitting surface has an optical power output of about 1.5 W in continuous mode, with peaks of 4 W in pulsed mode. By combining several of these array-structured diodes, "monolithic strips" are built. Usually about 1 centimeter long, monolithic strips can deliver optical powers in excess of 10 W in continuous mode. The final step involves piling the strips in the stacks. Here, again, power is increased tenfold (such stacks may yield more than 1 Kilowatt in QCW mode).

However, assembling stacks is complex. Moreover, they are not well-suited to high-density power generation in continuous mode because of thermal problems. Hence the interest of monolithic, planar power laser diode structures.

#### Three Times Better Than Conventional Planar Structures

Called "surface-emission monolithic board," Thomson Hybrides' structure is made through monolithic integration of diode strips between reflectors set at a 45° angle on a single GaAs substrate. This structure makes use of technologies such as quantum well layer epitaxy on a previously etched substrate, as well as laser face etching. Here, laterally emitted laser beams are reflected at a 90° angle, hence the term "surface emission." Based on this structure, the Thomson has made a 0.1-cm<sup>2</sup> demonstrator model with an output of 100 W in QCW mode. By stacking 10 such elements, it even produced a 1-kW QCW prototype. In fact, Thomson has achieved a power density (1 kW/cm<sup>2</sup>) equivalent to that of conventional stacks and three times greater than the best results recorded so far with planar structures. If this planar structure is economically advantageous compared to 2D structures, Thomson showed it also has other benefits: less divergence of the output beam (hence better coupling characteristics in solid-state laser pumping applications, for example), and better thermal control, so that the structure is better suited to high-rate or even continuous output applications. All the French manufacturer has to do now is move on to the next step, that is, the industrial production of its laser diodes.

### TELECOMMUNICATIONS

#### Telekom Experiments With Optical Fiber Networks for Households

93WS0018A Frankfurt/Main FRANKFURTER  
ALLGEMEINE in German 30 Sep 92 p N3

[Article by Dietrich Zimmermann: "Optical Fiber Telephone Connection—Telekom Tests Optical Transmission to Households with Seven Pilot Projects"]

[Text] For long-distance telephone lines conventional copper cables have been largely replaced by fiber optic

systems which transmit the data signals using laser light. In seven pilot projects, Deutsche Bundespost Telekom is currently testing the possibility of replacing the copper double lines leading to individual households by fiber optical cable as well. According to Telekom, German unification has accelerated planning for fiber optic household connections. While the old federal states have an efficient copper infrastructure, Telekom was suddenly faced with the task of having to replace and streamline the very sketchy and run-down technology in the new federal states.

About nine million new household connections will have to be established within the next seven to nine years. This will require DM55 billion; DM6 to 8 billion for the telephone lines alone. Even a gigantic enterprise like Telekom—with sales of DM50 billion the largest telecommunications company in Europe and the third largest in the world—will have difficulties raising that much money. The greatest problem is the time pressure which faces the renovation project because it would make sense to design the complete structure in the new states including end users as an optical fiber system. The trend towards optical systems is unavoidable for two reasons: the digitalization of telecommunication systems is progressing speedily and the broadband services such as data transmission, videotelephone and high-resolution TV (HDTV) are becoming more interesting and more affordable for private users as well.

It would make sense to place the required optical cable at this point since the roads have to be torn up anyhow. But the demand for broadband services is not yet strong enough to justify the costly placing of fiber optical cables. Moreover, it is not yet clear which fiber optics concepts are most suitable for distribution services. Finally, there are not enough devices with which end users could utilize the advantages of optical data transmission for services such as long-distance calling and fax.

Still, Telekom is concentrating on fiber optics. Telekom holds a monopoly on transmission lines, which is an advantage, since it is able to plan long-term investments. It was decided to supply about 1.2 million housing units with connections for telephone, data transmission, radio and TV using the most advanced optical fiber systems by 1995. Gerd Tenzer, member of Telekom top management, commented on this decision: "In doing so, we are the first network operator worldwide to leave the test phase and start the planned expansion of subscriber connections with fiber optics systems."

This is a courageous decision, because the different fiber optics concepts are still being tested as part of "Opal" pilot projects in seven cities. Opal is the abbreviation for "optical access line." There are at least four basic concepts for the design of a distribution network: The connections can be arranged going from the lowest exchange to the end users in the form of a star, a double star, a bus or a ring.

With a star pattern, a separate line goes from the exchange to each end user. The double star is similar to a tree structure: First, many end users are combined on a "trunk" line which is then divided into several "branches." Separate lines go from the end points of these branches to the individual connections. With a bus-system a trunk line is passed directly to many subscribers, so that the access line is branched out at a point close to the end user. In simple



terms, a ring system is a bus system whose trunk line is continued to the exchange forming a closed ring. In this case, a trunk line is nothing but an optical fiber cable which allows the simultaneous connection of many subscribers using the so-called multiplex packaging technique.

These different systems have very different characteristics. In a star system, for instance, many individual lines are required; however, dividing and branching points are not necessary. A ring system is more costly than a bus structure, but it works more dependably. The pilot tests are to find out which network architecture best meets the various requirements—whether rural areas require a different structure than densely populated areas and how major subscribers who depend on high data transmission rates can be integrated into the base systems. It is hoped that the first complete fiber optics systems will be available for end users in a few years and that it can be sold at a reasonable price due to competitive pressures.

The number of participants in the pilot projects is between 50 for Opal-2, located in the banking district in Frankfurt, and 4500 for Opal-3 in rural Lippetal. The first trial, Opal-1, had been started in Cologne in 1990. The networks in Frankfurt, Nuremberg and Leipzig have been in operation since mid-1991. While no final results are available yet, it is already obvious that fiber optics technology has developed into an economically acceptable alternative to copper technology for distribution purposes as well.

#### **France Telecom Selects Test Sites**

93WS0149B Paris AFP SCIENCES in French  
19 Nov 92 p 21

[Article: "Future Telecommunications Network To Be Tested at Four French Sites"]

[Text] Bastia—On 16 November, at Bastia, Minister of Posts and Telecommunications Emile Zuccarelli disclosed the four sites that have been selected for tests to be conducted by France Telecom on the future French telecommunications network. They are: Bastia (Haute-Corse), Arcahon (Gironde), Epagny (Haute-Savoie) and Saint-Ouen-l'Aumône (Val-d'Oise).

These tests will be based on distinct industrial proposals and the test sites will differ in population density and living conditions, said the minister, who is also Bastia's mayor.

Optic fiber has been selected as the medium of transmission, but different approaches had to be tested with respect to equipment and its installation, particularly as regards the terminal connection (street level, base of the building, and subscriber's premises), and new methods of operation and maintenance, suited to these techniques, had to be studied.

The entire telecommunications distribution and connection network will have to be renewed around the beginning of the 21st century, according to the minister. The plant facilities currently being used are inherently limited as to throughput (copper) and distance (coaxial cable), he said, necessitating a new infrastructure capable of supporting the new requirements, and of carrying telephone, telex, Numeris service, video telephony, facsimile, specialized high bit-rate circuits, radio, and television, all at the same time.

On Bastia, with the manufacturers' help, and in particular Alcatel's, France Telecom will test the advantages of all-fiber-optic connections on the subscriber's premises. A 220-kilometer fiber-optic highway has been installed between Bastia and Ajaccio, and between Ponte Leccia and Ile Rousse.

#### **Thomson-CSF Develops Radio Frequency Control System**

93BR0250 Paris ELECTRONIQUE INTERNATIONALE  
HEBDO in French 3 Dec 92 p 3

[Text] At the last World Radio Communications Administrative Conference in March, radio frequencies were reallocated. It is still necessary, however, to ensure that the measures taken are respected, both at the level of conformity with the technical specifications imposed on a particular network as well as at the level of the authorized operating rules. The administrations owe it to themselves therefore to acquire efficient frequency spectrum control systems. In France, the DRG [General Regulatory Directorate] has recently retained Thomson-CSF to study the French system of frequency control. Under the terms of the contract, which amounts to several dozen million French francs, the firm will provide a network prototype which will be installed in the Paris area in early 1994. Other companies involved are Syseca, I2E, and Cap Sesa Tertiaire.

## COMPUTERS

### Hungary: SZAMALK Computer Firm's Strategy, Plans Presented

93WS0084A Budapest *COMPUTERWORLD/*  
*SZAMITASTECHNIKA* in Hungarian 22 Sep 92 p 17

[Interview with Miklos Havass, director general of SZAMALK, by Gabor Revesz: "A Large Enterprise, After the Age of the Socialist Market"]

[Text] In 1982 the KSH [Central Statistics Office] created SZAMALK by uniting three large computer technology enterprises. For years the enterprise worked as a monolithic unit; changes began with the proliferation of kft's [limited liability companies], but the leading firm of the group remained in state ownership. Miklos Havass, director general of the firm, talked to our journal about the further plans and privatization process for the enterprise group.

**Revesz:** To begin with history, out of what and for what purpose did the KSH create SZAMALK?

**Havass:** Of the three founders SZAMKI (Computer Technology Research Institute) dealt primarily with research and development, it participated in large undertakings, and carried out research and development and coordination tasks in ESZR/MSZR (the bloc uniform computer systems) projects. SZAMOK (Computer Technology Training Center) conducted internationally recognized training activity as a budgetary institution and published computer technology books and journals. NOTO-OSZV (National Organization for Technical Servicing and the National Computer Technology Enterprise) sold computers produced in the socialist countries. By 1982 it had become obvious to the leaders of the country that in the increasingly open market economy there was no money to maintain separate research and development, training, and monopoly trade units, so the KSH thought: If these were integrated in a common enterprise—"vertically" to use the word used then—they would be able to create one profit oriented firm active in every area of computer technology. At that time profit orientation meant that SZAMALK got no state administrative support but lived from the various products and services sold on the market. In the beginning the size of its market was 1.8 billion forints annually, this increased to 2.5 billion later. Unfortunately 1.8 billion of this was represented by income coming from sale of eastern European machines in Hungary and the associated software development and training.

**Revesz:** When and in what way did this structure change?

**Havass:** The year 1988 brought a substantial turnaround. Earlier Hungary was a net exporter in computer technology, that is it sold more machines to the socialist countries than it imported. As a result the government kept the acquisition value for computers high because in this way the favorable export-import difference could be skimmed off at the national level. But it could be seen already in 1988 that this state of affairs could no longer be maintained. It was no longer possible to export enough to the purchasing Soviet market and the earlier amount could not be imported from there for the strengthening Hungarian market economy. So they said we were no longer interested in such deals. The 1.8 billion forint eastern European computer market of SZAMALK was lost overnight. No one offered any more support

to bring these machines into the country so we could sell them and the services associated with them. In addition to our losing our market we had an incredibly large inventory of computer accessories and software, and this represented a real financial problem for us. An extensive organization with large numbers of personnel remained without work. So a reorganization of the enterprise could not be postponed. So SZAMALK ceased to exist as a monolithic enterprise as of 1 January 1989. The new organization—one of the first in Hungary—became a holding company, which meant creation of the SZAMALK joint stock company and the creation of 34 limited liability companies, some of which operated as mixed enterprises. In these firms the property of the state enterprise generally became the preponderant part but the leaders and workers also had a share of their capital. The years 1989-91 were filled with creating financial stability and rebuilding the market. With an appropriate exchange of property elements we got some working capital, paid off our debts and wrote off our idle inventories. We created a new market. After the collapse of the ESZR program we organized a new 1.4 billion forint market to add to the remaining 300-400 million one. We developed our training activity to a significant degree and we became distributors, dealers and strategic partners for a number of Western firms. In addition we opened up new branches of business, for example in domestic trade or in the form of consulting activity.

**Revesz:** How far along is the privatization of the firm, what are the next steps which can be seen today?

**Havass:** At this moment, as a preparation for privatization, the value of SZAMALK is being ascertained; until this is completed a precise figure cannot be given, but I feel that this property is over a billion forints. In regard to the enterprise group as a whole the largest part of this consists of fixed assets, including buildings. As for the process, we want to transform the entire holding, the administrative state enterprise. We think of this as happening in two steps. Probably this year the state enterprise will become a company in the second privatization wave. But this transformation can lead to real privatization only with a clearer property and ownership structure, which will come about in the spring or early summer of next year. In our opinion two essential groups would have to participate in the privatization. One is a group embodying the leadership and workers of the enterprise, where we are counting on those key people who are in some way determining in the life of SZAMALK. The second group is represented by the foreign professional investors; here the primary goal is aiding the professional future. We have not yet decided whether to seek one or more such investors. This will depend on whether we seek a single partner for the privatization of the entire enterprise, a partner capable of helping us in every branch of business, or whether we bring two or three partners into the three basic branches. We will expect from these partners technology and market contacts in addition to possible capital. We increasingly feel that the producing or trading joint ventures being created will gladly work with a firm in which their traditional western European computer or information partners are present as owners as well. According to the present intent no state ownership will remain in SZAMALK, but naturally this does not mean that the transformed SZAMALK will not carry out state tasks.

**Revesz:** What path will the privatized SZAMALK take?

**Havass:** We are now planning a strategy for the future after privatization. In this process we have to think through what place SZAMALK can win for itself on the transforming Hungarian market, in what branches it can compete with the needs of the market, with what strength, with what investments and at the price of what reorganization. It causes a problem in the course of strategic planning that because of the extraordinarily swift transformation characterizing the present Hungarian market there are no settled statistical figures, trends or habits. So it is a good bit more difficult than usual to predict which branch will develop quickly, who the competitors will be, how big the customer circle will be, what influence foreign capital may have. Despite this our plans must contain details. We think that after implementing our three-year plan, now being developed, SZAMALK will be an undertaking with significant Hungarian ownership active primarily in the area of system integration and added value. In our opinion it will employ about 500 people and in its personnel a substantially larger role than at present will be played by commercial types, "trade engineers." We regard as a commercial type also someone who can sell unique systems involving complex unique services. On the other hand I feel that the number of programmers in the traditional sense, coding in one or two languages, will decrease greatly; but there will continue to be a great need for system integrators with vision—people who can create large systems from existing elements, or by creating elements which might be needed. Modernization of the domestic information system is a key question for our progress. The leading western providers have a real advantage over domestic ones in that they have data collections on the basis of which they can measure the market possibilities, their user circles, and thus can respond very quickly, to a tender for example.

We feel that the traditions of SZAMALK point to the market for mainframes and medium minis, and here also is the greatest possibility for adding value, so we continue to regard this as our chief direction. But the microcomputer world cannot be omitted from the palette in the present situation either—especially the software here.

## TELECOMMUNICATIONS

### Hungary: Ericsson Designed Pilot Mobile Phone System Started

93WS0088A Budapest *MAGYAR ELEKTRONIKA*  
in Hungarian Oct 92 pp 47-49

[Unattributed article: "GSM Arrives in Budapest"]

[Text] Simultaneous with the Budapest demonstration, this month, of the GSM mobile telephone pilot system, Andre Grace, the area manager of Ericsson Radio Systems responsible for Hungary, described this technology and explained what it offers to users.

With the demonstration of an operating digital cellular network at the ITU Europa Telecom 92 world exhibition, Budapest became one of those cities of Europe which provide digital mobile telecommunications service.

The pilot GSM network—operated by Westel—covers the center of Budapest (with a branch to the airport) with a capacity of more than 1,000 subscribers.

Users of the new system get access to the broad scale of services provided by modern GSM based networks, including digital data transmission and international connections with all of Europe.

Ericsson designed the pilot system, using the AXE based system prepared for GSM called CME 20. The characteristics of the network consist of a mobile switching center (MSC), base station control (BSC) and four base transceiving stations (BTS).

Ericsson also provides the successful NMT 450 analog cellular system operated by Westel. After two years of operation this network serves 15,000 subscribers and 70 percent of the country.

Setting up GSM in Budapest was a strategic step in the integration of telecommunications systems—within Hungary and with neighbors across the border. For its part Ericsson sees it this way: Delivering the system is a sign of the definite resolve of the firm to support the telecommunications provider firms in this region.

### Why Digital?

Since the first commercial mobile cellular services hit the market—about 10 years ago—they have gotten more than 16 million subscribers (from 70 countries). The first countries—which introduced cellular services—now approach 10 percent mobile telephone coverage of the populace.

If the present rate of growth continues there will be more than 250 million cellular subscribers around the world by the turn of the century.

The swift growth of analog cellular networks throughout the world is one of the chief business successes of the 20th century. The swift development of digital technology adds an important factor: It is simply not worth it to meet the ever increasing capacity demand with analog technology.

The introduction of digital cellular technology made it possible to increase the capacity of the network, that is, to connect mobile telephones to an ever widening circle of users. Significant development also took place in the design of the phones and in their services.

Thanks to the unified digital cellular standards users can initiate a call or receive one while traveling anywhere in the world.

In digital cellular networks the voice signal goes from the mobile telephones to the base stations in the form of a binary signal stream instead of as a continuous analog signal.

Digital radio technology substantially increases capacity because the system is capable of handling more calls or signal information at the same time. This high degree of efficiency makes it possible to develop standardized, digital cellular systems covering a large area.

### The GSM Standard

The GSM specification by the European Telecommunications Standards Institute (ETSI) in 1987 signaled new operational or mobility possibilities for cellular telephones in Europe and throughout the world.

Eighteen European countries committed themselves to introduction of GSM based digital cellular systems. In

addition a number of countries around the world—including Russia, Australia, New Zealand and Hong Kong—introduced GSM systems.

When the entire network is built up subscribers will enjoy previously unknown freedom; they will "ramble" across national borders while having access to developed cellular services, using the same telephone sets and subscriber number.

So the GSM services will achieve substantial progress in the areas of efficiency and competitiveness, in business contacts at the international level. With the aid of the GSM network it will be possible to realize new possibilities—such as mobile data transmission, fax, message forwarding and a personal paging service covering large areas. The perfected signaling and control offered by the digital cellular system will make it possible for operators of the network to offer different services to different subscribers.

Digital cellular radio has the additional advantage that it provides very good quality speech transmission and the coding of speech with digital transmission offers great security against eavesdropping. Even greater security can be obtained by coding the digital transmission, which makes it impossible to tap lines.

With the constant miniaturization of circuits and decreased consumption a digital mobile telephone will be ever lighter and more efficient for users.

#### **New Radio Transmission Technology**

The GSM networks use a TDMA [time division multiple access] transmission technology. This increases capacity by dividing the band width, time and frequency range available.

Digitally coded speech is transmitted in brief packets or time slots and can be built into other channels by bit stitching. In GSM this makes possible the independent transmission of eight channels, with every available 200 kHz carrier frequency.

Compared to analog transmission the digital system has great immunity to crosstalk among channels. The coding of low bit speed speech by digital means further improves the speed with which traffic can be handled.

#### **Digital Telephones: Better Efficiency, More Services**

Ericsson has developed new cellular telephones which are capable of maximal exploitation of the advantages of GSM networks, using the TDMA technology. These use the newest digital signal processing and VLSI technologies, thus ensuring a smaller, lighter version with greater processing abilities.

For example, the processing capacity of the newest digital cellular telephone developed by Ericsson for GSM is about 50 MIPS [million instructions per second]. This value for a normal computer is less than 10 MIPS. These telephones exploit the advantages of the new "intelligent card" technology. A card containing all subscriber data is put into the telephone to operate the set.

The card informs the cellular system of the individual call number of the subscriber (which is how it receives calls) and about toll details (so the proper person gets the bill). In

addition it is capable of storing the electronic address and abbreviated call numbers of the subscriber and of loading these into the set.

This type of intelligent card also makes it possible for the subscriber to travel or borrow phones. In addition it prevents use of cellular telephones without permission, since without the card the set will not operate.

Each of the new digital telephones has a four digit personal identification code. This can be used to block outgoing calls from the set. This makes use without permission even more difficult.

Use of the new digital signaling technique decreases power consumption in the set. As a result there is more room for the battery and this increases speech time. For example, the latest GSM pocket telephone from Ericsson has a 90 minute speech time or 15 hour ready time, with a normal battery. This represents a 50 percent increase compared to the preceding analog sets.

Versions which can be installed in automobiles contain voice recognition and push button call reception (on pushing any button), so the driver can answer a call without letting go of the wheel. The pocket telephone contains a small earphone and a sensitive microphone. So the user can telephone without holding the set in his hand.

In addition to these properties the new digital telephone also has an alphanumeric memory suitable for storing 99 names and telephone numbers, also suitable for automatic search and swift dialing of the numbers. These numbers can also be stored in the intelligent card of the subscriber.

In the future the use of digital mobile terminals will not be limited to speech transmission only. The transmission of telefaxes, electronic messages, computer data and even video signals will be as general in cellular systems as speech transmission.

#### **New Services**

Every service obtainable on a current analog cellular network can also be realized on a GSM based digital network. In addition a few new services can be introduced. These are given below.

- **SIM Card**—Information on every individual subscriber can be stored on a so-called SIM (subscriber identification unit) card. By putting this card into any GSM telephone the subscriber can use it as if it were his own.
- **International Use**—The same telephone or SIM card can be used on any GSM system in the world.
- **Brief Message**—A brief message (160 alphanumeric characters) can be transmitted from any caller to any caller.
- **Information Service**—Transmission of information of local interest, for example, traffic, weather, sports or economic data.
- **Data Transmission**—The possibility of connection to an asynchronous or synchronous modem or packet switched network.

The demonstration of the Budapest pilot network is only the beginning in Hungary of a digital cellular network. The popularity of the analog cellular network shows a national need for mobile telecommunication. With its new services,



good quality speech transmission and the large capacity and reliability of the network GSM can increase the demand for mobile telecommunication.

### **Hungary, UK: Micronetwork Systems Activities Presented**

92WS0095A Budapest *COMPUTERWORLD/*  
*SZAMITASTECHNIKA* in Hungarian 15 Sep 92 p 4

[Interview with Janos Pallagi by Jozsef Mess: "Lasers in Telecommunications"]

[Text] Few know that the laser beam is suitable for data transmission as well as its medical and industrial uses. One of the domestic experts in use of lasers in telecommunications is Micronetwork Ltd., formed a few years ago. We talked to business manager Janos Pallagi about this.

**Mess:** What ideas got you into this and what results has Micronetwork achieved?

**Pallagi:** The Court of Registration registered the company in March 1989 as an English-Hungarian joint venture. Its founders were the English firm Micronetwork Systems Ltd. and Hungarian private citizens. Even prior to this my colleagues and I were working on a similar undertaking. Some of my colleagues then thought that we should orient ourselves toward telecommunications. Finally this gave the idea of starting over. Our activity coincides with that of the parent enterprise in London; we primarily develop software and hardware but in addition we also deal with trade. Micronetwork has developed dynamically since its formation, the number of our domestic partners now exceeds 600. Last year our receipts reached 75 million forints and this year we are counting on 100 million.

**Mess:** What sort of products are your customers most interested in?

**Pallagi:** Today our computer telex program called Telexnet is operating in more than 400 places. The system conducts telex traffic in the background mode; with its aid anyone can receive or send telex messages from his own computer workstation. It can handle several telex lines simultaneously in the network mode, automatically recording the messages, and the program includes a special text editor developed for this purpose. In our MMSS message switching system we have integrated various telecommunications services; thanks to these one can access various communication lines (telex, fax, modem, X.25, E-Mail) from any terminal. The MMSS works in UNIX, AS/400, PC-LAN or VAX based networks; it optimizes line use, it can interconnect different operating systems and it divides the costs among users on the basis of up-to-date fee tables. At the same time its modular construction permits custom installation and expansion. At present we are working on initiation of a new service, jointly with TEL-EX Ltd., which is responsible for uninterrupted operation of the 10,000 line domestic telex center. With the aid of the MMSS message switching system the company will make it possible, in the near future, for telex subscribers who do not have a telefax to send fax messages from their telex machines.

**Mess:** The syllable "net" appears in the name of virtually all of your products.

**Pallagi:** We did this to indicate that the overwhelming majority of our developments were prepared for network users. Our commitment to network systems is well reflected by the fact that not long ago we added the network products of the D-Link firm to our list of offerings. So far we have installed networks in nearly 50 more significant places. Among these we should mention the structured UTP networks which tie together several buildings and the linking, with laser data transmission, of an Ethernet network working in two high buildings on the banks of the Danube. In this latter project we succeeded in using a data transmission procedure which is something new even for Western Europe. We got the commission after connecting by this method two Token-Ring networks as a demonstration in 1990. The system, operating between two office buildings, transmits data with 10 megabit per second Ethernet speed and is capable of transmitting voice and picture information as well. In price this data transmission solution is comparable to optical cable, and it can be built quickly. Its use is especially recommended for places where creating a landline connection would be too expensive or time consuming. In addition this method has a great future in telecommunications for with the aid of a laser beam one can transmit a thousand telephone conversations simultaneously, no permit is needed to operate it, and its effective distance can reach 10 kilometers.

**Mess:** On what other user areas are you concentrating, in addition to telecommunications?

**Pallagi:** A special place in the offerings of our firm is occupied by our Mednet integrated health system developed specifically for hospitals and clinics; it runs in a UNIX and an MS-DOS/LAN environment. When developing Mednet, which consists of two module groups, we tried to handle hospital and clinic information in a uniform manner. With the aid of our system one simplifies traditional case history preparation, final reports can be accessed quickly, and the allocation of operating rooms presents no problem.

Modules using the same screens (laboratory module, admissions module, nutrition module, etc.) can be reviewed as desired. There is also a general ledger system, so, for example, medicine supply, special diets and meals can be connected to the warehouse. The system works in a network and isolated centers or dispensaries can connect into it via the telephone network. By using Mednet even district physicians can quickly access data on patients which are recorded in other health institutions.

**Mess:** Where is Mednet being used here?

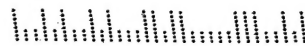
**Pallagi:** A full version of our integrated health and business system operates at the Szigetvar Hospital and the Budagyongye Hospital. We should also mention our clinical information networks installed in Nagykoros and Godollo and at the Dabas United Health Institutes; these facilitate administrative work connected with basic supply to the populace of these towns. Installation of complete systems is now under way in two Pecs hospitals and the Tata hospital and we are working on a complex connection of the clinics in Kistelek, Szazhalombatta and Mako, together with their surrounding districts.

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